

**Slide Name:** (GP 21) SH 719 Henderson Creek (BF 73982)  
**Inspection Date:** June 25, 2003  
**Inspection By:** – Alberta Transportation and EBA Staff listed on Page 1  
– Ajit Paramapathy, P.Eng., David Morrison (AT Bridge Engineering Staff, Peace River)

## 1.0 BACKGROUND (reiterated from 2002 report)

- A slide occurred at a fill embankment over a double culvert at Henderson Creek. The slide extends from the toe to the top of a 12 m high embankment. The headscarp has retrogressed to the shoulder line of the northbound driving lane of SH 719.
- The slide was first inspected by EBA in July 2001 (refer to site inspection report in EBA letter of July 18, 2001).
- The slide was triggered by:
  - Toe scour resulting from a cumulative pile up of drift wood (over several years) at inlet of the culvert, causing a constriction of the channel.
  - Fill construction consisted of a "snake pit" of buried wood and organics contributing to an unstable toe area.
- Depth of sliding failure was estimated to be relatively shallow at around 1 to 3 m. The core of fill was estimated to comprise competent material.
- A slide investigation and remediation design report was issued (EBA letter report of December 18, 2001) with the following recommendations:
  - Clean out drift wood regularly to alleviate concentrated flow at existing culvert inlets.
  - Clean out "snake pit" of buried organics.
  - Extend length of culverts for toe berm construction.
  - Construct toe berm with granular blanket.
  - Reconstruct slope.
  - Replace double culverts (if required for hydraulic flow capacity).
- A tie-back retaining wall design was preliminarily investigated to stabilize and prevent the headscarp area from retrogressing into the northbound driving lane. The design, consisting of a reinforced concrete wall using screw anchors for a tie-back system, was considered appropriate due to the assessed shallow depth of failure. The design would provide a medium-term remediation life (5 to 10 years), which is considered adequate given that complete fill/culvert replacement is proposed for 2009.

## 2.0 OBSERVATIONS

- The width of headscarp along the shoulder edge has increased to 40 m since 2001/2002 due to the continual erosion of the slope toe. Thus, a 40 m length of retaining wall would have to be designed. A 3 m high, tie-back retaining wall, with two rows of tie-backs at 1.5 m (lateral and vertical) spacing, will be considered.
- It was discussed that construction of the tie-back retaining wall may be carried out during the fall of 2003.

- From discussions with AT Regional Bridge Engineer on site:
  - It is understood that the placement of a new culvert and reconstruction of fill is scheduled for 2009.
  - It was understood that the proposed slide remediation design by EBA (toe berming, clean out of buried organics and extension of existing culvert) (December 18, 2001 report by EBA) will not be undertaken as they have planned to reconstruct the culvert and fill in 2009.
  - Temporary erosion control measures will be constructed in fall 2003 at the upstream toe area. The temporary measure will entail rip-rap protection of precast concrete panels (used material in-stock) that will be installed and/or gabion rock structure along the eroded areas along the toe. The required sub-excavation of buried organic material at the toe, as proposed in EBA's December 2001 report recommendations, will not be carried out as part of the works.
  - EBA cautioned that the erosion protection at the toe may not be effective for long-term performance if the deleterious organic materials remain buried under the toe. However, on consideration of the 6 years until 2009 when reconstruction (fill and culvert) is scheduled, AT Regional Bridge Engineer considers the functionality of such temporary work acceptable.
- A new, small drift pile was observed accumulating at the culvert inlet around the drift rack. The drift rack was last cleaned in spring 2002.
- The extent of toe scour has increased since the 2002 inspection as the previous rip-rap protection was washed out. This toe scour has widened the headscarp from 20 m (in 2001/2002) to 40 m (in 2003) along the road shoulder edge.

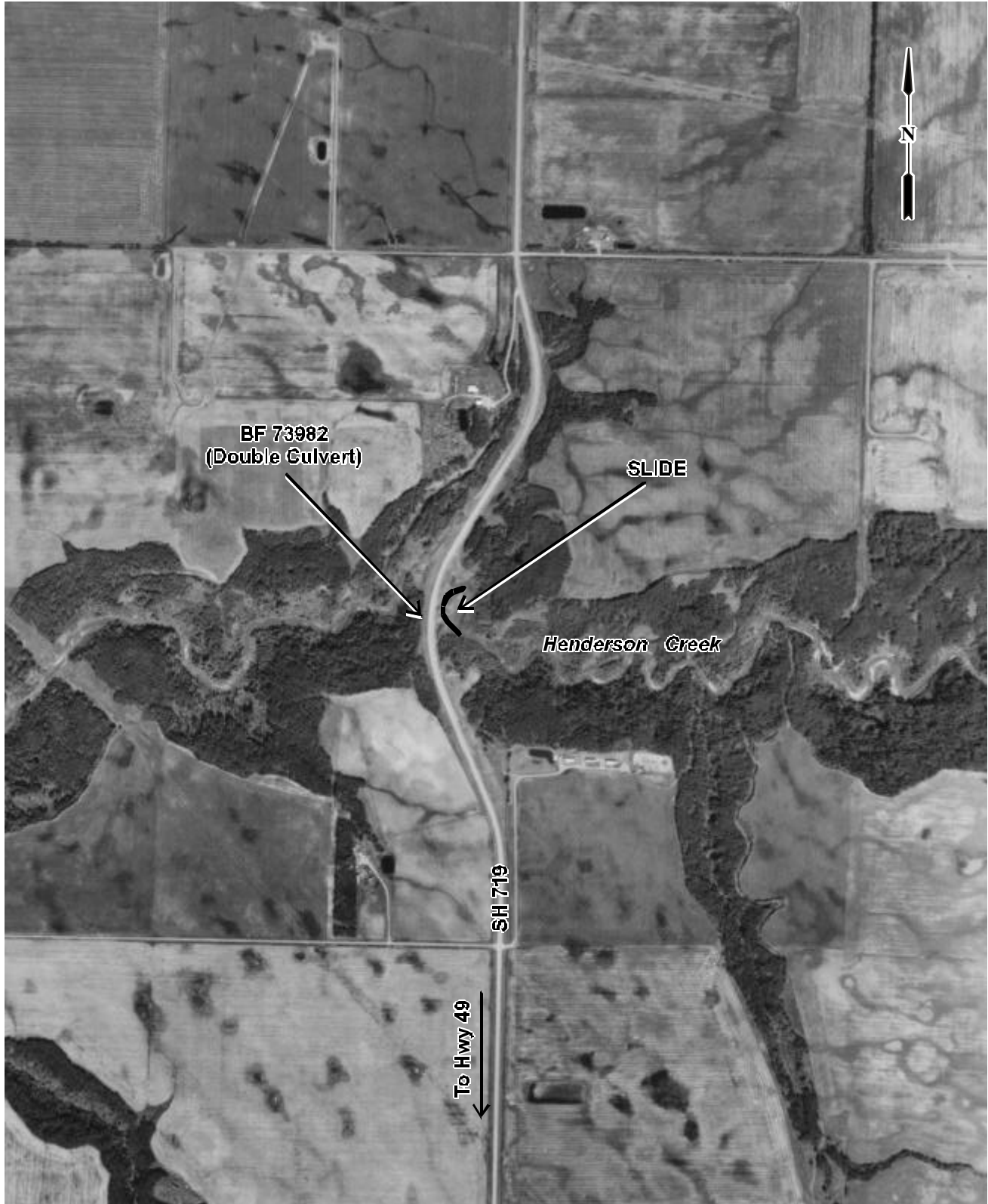
### **3.0 RISK ASSESSMENT**

$$PF (11) * CF (2) = 22$$

Risk rating has not changed since that assessed in 2002.

### **4.0 ACTION**

- Visual monitoring of this site should be carried out regularly by maintenance staff.
- The design of temporary tie-back retaining structure should be considered only for the medium term (5 to 10 year) life because the full remediation design (December 2001) and/or culvert replacement will not be completed until 2009.
- In view of the lack of complete remediation strategy, the temporary tie-back retaining wall structure should be constructed as soon as possible (fall 2003); the design is to be submitted by EBA.
- The temporary works of toe protection (as proposed by AT Bridge Engineering) should be carried out as soon as possible (fall 2003). EBA cautioned that such temporary toe protection may pose a risk of slope failure because the buried organic material will not be excavated at the eroded slope toe area.



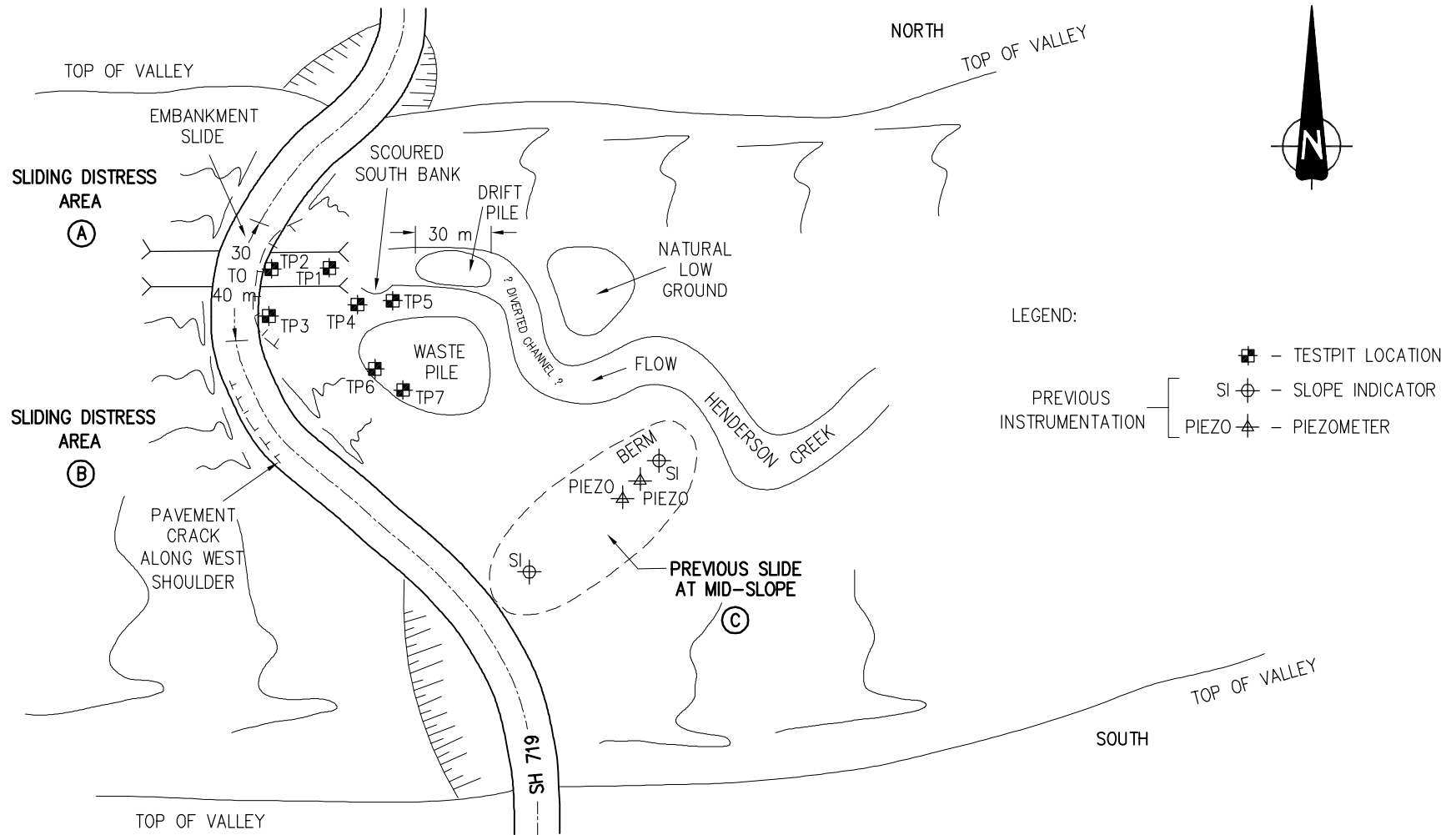
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Figure 1

2001AerialPhotograph

7100131Q48b.cdr





NOTES: 1) TP4 AND TP5 REVEALED BURIED 1-2m THICK ORGANIC AND WOOD DEPOSIT BENEATH FILL AND ABOVE RIVER GRAVEL  
2) DRAWING NOT TO SCALE

Figure 2  
GP 21  
SH 719 Henderson Creek North of Hwy 49

**Photo 1**

- Headscarp progressed to cause sagging of guardrail
- Looking at upstream slope face with flow from right to left

**Photo 2**

Widening of headscarp crack to 40 m along roadway shoulder

**Photo 3**

- Looking upstream
- Accumulation of drift after 1 year (last cleared out in spring 2002)
- Bank scour extends ~10 m on either side of drift rack (previous 2001 scour extended ~5 m on either side of drift rack)
- Buried organics at toe of fill and bank areas

*Note: Photos taken June 2003*